

**What Is Claimed Is:**

1. A method of fabricating a semiconductor device comprising:  
selecting a starting semiconductor substrate having a defect density;  
forming a semiconductor layer on said starting semiconductor substrate;  
forming active components on said semiconductor layer; and  
removing said starting semiconductor substrate.
2. The method of claim 1 further comprising:  
controlling a doping level for said semiconductor layer.
3. The method of claim 2 wherein said doping level is uniform for the semiconductor layer.
4. The method of claim 1 wherein said starting semiconductor substrate and said semiconductor layer are made from GaAs.
5. The method of claim 1 wherein said starting semiconductor substrate is made from GaAs and said semiconductor layer is made from epitaxial growth of a single crystal material.
6. The method of claim 5 wherein said semiconductor layer is made from AlGaAsP.
7. The method of claim 1 wherein said starting semiconductor substrate has a low defect density.
8. The method of claim 7 further comprising:  
controlling a doping level for said semiconductor layer.
9. The method of claim 8 wherein said doping level is uniform for the semiconductor layer.

10. The method of claim 7 wherein said starting semiconductor substrate and said semiconductor layer are made from GaAs.
11. The method of claim 7 wherein said starting semiconductor substrate is made from GaAs and said semiconductor layer is made from epitaxial growth of a single crystal material.
12. The method of claim 11 wherein said semiconductor layer is made from AlGaAsP.
13. A method of fabricating an optical device comprising:
  - selecting a starting semiconductor substrate having a defect density;
  - forming a semiconductor layer on said starting semiconductor substrate while controlling a doping level for said semiconductor layer;
  - forming a gain cavity on said semiconductor layer; and
  - removing said starting semiconductor substrate.
14. The method of claim 13 further comprising:
  - controlling a doping level for said semiconductor layer.
15. The method of claim 14 wherein said doping level is uniform for the semiconductor layer.
16. The method of claim 13 wherein said starting semiconductor substrate and said semiconductor layer are made from GaAs.
17. The method of claim 13 wherein said starting semiconductor substrate is made from GaAs and said semiconductor layer is made from epitaxial growth of a single crystal material.
18. The method of claim 17 wherein said semiconductor layer is made from AlGaAsP.
19. The method of claim 13 wherein said starting semiconductor substrate has a low defect

density.

20. The method of claim 19 further comprising:  
controlling a doping level for said semiconductor layer.
21. The method of claim 20 wherein said doping level is uniform for the semiconductor layer.
22. The method of claim 19 wherein said starting semiconductor substrate and said semiconductor layer are made from GaAs.
23. The method of claim 19 wherein said starting semiconductor substrate is made from GaAs and said semiconductor layer is made from epitaxial growth of a single crystal material.
24. The method of claim 23 wherein said semiconductor layer is made from AlGaAsP.
25. A method of fabricating an optical device comprising:  
selecting a starting semiconductor substrate having a defect density;  
forming a semiconductor layer on said starting semiconductor substrate while controlling a doping level for said semiconductor layer;  
forming a gain cavity on said semiconductor layer;  
removing said starting semiconductor substrate;  
forming a first conductor on the gain cavity layer on a side of said semiconductor layer;  
forming a second conductor on an opposite side of said semiconductor layer; and  
disposing an external mirror/lens relative to said semiconductor layer to create an extended cavity.
26. The method of claim 25 further comprising:  
controlling a doping level for said semiconductor layer.

27. The method of claim 26 wherein said doping level is uniform for the semiconductor layer.
28. The method of claim 25 wherein said starting semiconductor substrate and said semiconductor layer are made from GaAs.
29. The method of claim 25 wherein said starting semiconductor substrate is made from GaAs and said semiconductor layer is made from epitaxial growth of a single crystal material.
30. The method of claim 29 wherein said semiconductor layer is made from AlGaAsP.
31. The method of claim 27 wherein the doping level is selected between  $5 \times 10^{16} \text{ cm}^{-3}$  and  $5 \times 10^{17} \text{ cm}^{-3}$ .
32. The method of claim 26 wherein a majority of the thickness of said semiconductor layer is doped at a first level, and a remainder of the thickness of said semiconductor layer is doped at a second, higher level adjacent to said gain cavity.
33. The method of claim 25 wherein said starting semiconductor substrate has a low defect density.
34. The method of claim 33 further comprising:  
controlling a doping level for said semiconductor layer.
35. The method of claim 34 wherein said doping level is uniform for the semiconductor layer.
36. The method of claim 33 wherein said starting semiconductor substrate and said semiconductor layer are made from GaAs.

37. The method of claim 33 wherein said starting semiconductor substrate is made from GaAs and said semiconductor layer is made from epitaxial growth of a single crystal material.

38. The method of claim 37 wherein said semiconductor layer is made from AlGaAsP.